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"Common Warm Dust Temperatures around Main Sequence Stars"

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Abstract:

We compare the properties of warm dust emission from a sample of main-sequence A-type stars (B8-A7) to those of dust around solar-type stars (F5-K0) with similar Spitzer Space Telescope Infrared Spectrograph/MIPS data and similar ages. Both samples include stars with sources with infrared spectral energy distributions that show evidence of multiple components. Over the range of stellar types considered, we obtain nearly the same characteristic dust temperatures (∼190 K and ∼60 K for the inner and outer dust components, respectively)—slightly above the ice evaporation temperature for the inner belts. The warm inner dust temperature is readily explained if populations of small grains are being released by sublimation of ice from icy planetesimals. Evaporation of low-eccentricity icy bodies at ∼150 K can deposit particles into an inner/warm belt, where the small grains are heated to dust Temperatures of ~190 K. Alternatively, enhanced collisional processing of an asteroid belt-like system of parent planetesimals just interior to the snow line may account for the observed uniformity in dust temperature. The similarity in temperature of the warmer dust across our B8-K0 stellar sample strongly suggests that dust-producing planetesimals are not found at similar radial locations around all stars, but that dust production is favored at a characteristic temperature horizon.